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Pelagic Fisheries Research Program

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July–September 2006

The Effect of Pelagic Longline Fishing on Laysan and Black-footed Albatross Diets

David Duffy and Jeremy Bisson

Albatrosses are known for extraordinarily large home ranges. Laysan (*Phoebastria immutabilis*) and black-footed albatrosses (*P. nigripes*) in particular take extended trips from breeding colonies in Hawai'i north to the Aleutians or to the west coast of North America (Hyrenbach et al. 2002). They are long-lived and can only raise one chick per year (Rice and Kenyan 1962). Populations are scattered on small islands stretching across the North Pacific from Japan to Mexico (McDermond and Morgan 1993; Pitman 1988).

Remaining at sea during periods of non-breeding, Laysan and black-footed albatrosses range throughout the North Pacific, though black-footed albatrosses generally are more prominent in the Eastern Pacific (Gould and Piatt 1993). Despite vast expanses of ocean, albatrosses are regular visitors to fishing vessels. They come to feed on bait, offal, discards and floating catch. Albatrosses, attempting to steal bait off hooks, sometimes get caught and drown.

Understandably, most previous seabird-fishery interaction research has focused on estimating or reducing bycatch. However, once bycatch reducing methods are adopted by fisherman, albatrosses will still find and utilize fishing vessels for scavenging. Hence, pelagic longline fishing may continue to affect albatrosses by altering their diet and community associations.

The nature and extent of pelagic longline fishery scavenging by Laysan and black-footed albatrosses have not been addressed previously. Findings that the trophic dynamics of Laysan and black-footed albatrosses were affected by scavenging high seas drift nets prompted interest about the potential for pelagic longline fishing to affect albatrosses (Gould et al. 1997).

We addressed this issue by investigating patterns of attendance by Laysan and black-footed albatrosses at Hawai'i longline fishing vessels targeting tuna and swordfish (*Xiphius gladius*), depredation patterns, and diet and trophic relations of longline associated albatrosses.

Vessel Attendance and Depredation Patterns

We assessed vessel association patterns of albatrosses associated with Hawai'i based pelagic longline vessels targeting tuna and swordfish using NOAA Fisheries preliminary observer data records collected during 2005, the first full year since the swordfish fishery was reopened and the first full year seabird sighting data was collected.

Evidence of depredation on swordfish by albatrosses. Lethal damage to caught swordfish by sharks as well as cookie cutter shark bites may facilitate albatross depredation.

Observer data is useful because observers systematically record seabird sightings and all interactions during setting and hauling operations. Observers also document incidences of depredation by albatrosses.

Black-footed albatrosses were more commonly associated with both tuna and swordfish targeting vessels than were Laysan albatrosses, despite the fact that Laysan albatrosses outnumber black-footed albatrosses by an order of magnitude. Vessel attendance peaks during early breeding months in the winter. Attendance is greatest at swordfish vessels, which historically caught more albatrosses than tuna vessels (Cousins and Cooper 2000). Differences

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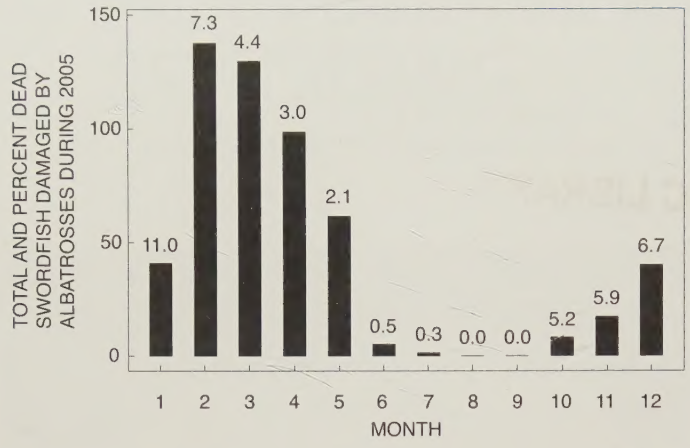
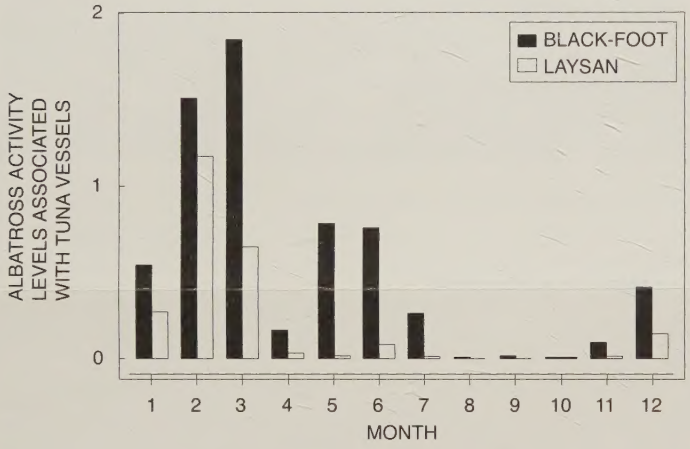


The frequency of albatross depredation on swordfish peaked in winter months in 2005.

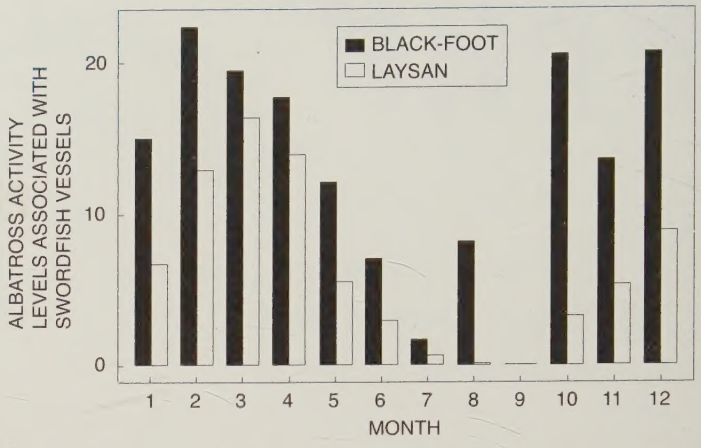


Monthly activity levels of albatrosses associating with tuna targeting vessels based on the monthly average of the daily maximum number of birds sighted from hourly scan counts conducted by observers. Black-footed albatrosses are more commonly found associating with tuna targeting vessels than Laysan albatrosses even though black-footed albatrosses are far less abundant.

between swordfish and tuna vessel association is likely due to differences in areas fished by tuna and swordfish vessels.

We also assessed depredation using catch damage records, as well as observations of albatrosses feeding on catch. Albatross depredation patterns mirrored patterns of vessel attendance by albatrosses. All of the albatross damaged swordfish were dead prior to landing. The proportion of dead swordfish landed with albatross damage peaked in January at 11 percent.

Results also suggest black-footed albatrosses were responsible for the majority of the albatross depredation of swordfish. Group size of albatrosses actively feeding on swordfish ranged up to 45 birds. Depredation often involves multi-species groups and likely involves additional albatrosses sitting on the side of, or lingering around, a swordfish carcass. While albatrosses appeared to be gaining a lipid rich meal through swordfish depredation, fisherman likely suffered a significant loss of revenues because of lost fish quality and weight.



Monthly activity levels of albatrosses associating with swordfish targeting vessels based on the monthly average of the daily maximum number of birds sighted from hourly scan counts conducted by observers. Black-footed albatrosses are more commonly found associating with swordfish targeting vessels than Laysan albatrosses.

Digestive Tract Content Analyses

We determined the diets of longline associated breeding age adult Laysan and black-footed albatrosses through digestive tract content analysis. Available stomachs from undamaged longline salvaged Laysan and black-footed albatrosses were examined. Food items were identified, weighed and sorted taxonomically. The gut contents of Laysan albatrosses (n=52) revealed feeding on species from 12 cephalopod families and 6 fish families. The gut contents of black-footed albatrosses (n=26) revealed feeding on species from 12 cephalopod families and 9 fish families.

We found that approximately 1/3 of the diets of both species were either of two fish species used as bait, South American pilchard (*Sardinops sagax*) or Pacific saury (*Cololabus saira*). Albatrosses to a lesser extent utilized Argentine squid (*Illex argentinus*) that were used as the predominant bait by swordfish targeting vessels.

Other important food for both species includes mesopelagic squid, especially *Taonius borealis*. Most of the albatross diets consisted of food that could be obtained through scavenging and there was little evidence of predation. Evidence of depredation on swordfish was not found, but we suspect identifiable swordfish parts are rarely consumed.

Stable Isotope Analyses

We also used stable nitrogen isotopes to analyze albatross diet. Stable nitrogen isotopes are useful in diet studies because they reveal differences in trophic positions and differences in regional habitat use. Animals feeding at higher trophic positions are enriched in $\delta^{15}N$ (DeNiro and Epstein 1981). However, there are also differences in $\delta^{15}N$ from animals sampled across the Pacific basin that are linked to regional stable isotope concentrations at the base of the food chain (Takai et al. 2000).

Some caution is warranted in interpreting these results because assimilation of diet into tissues is delayed somewhat such that

the present diet may be very different from the diet revealed by stable isotopes. However, it is believed that muscle stable isotope concentrations reflect a diet integrated over time making it useful for comparisons.

Results indicate that male Laysan albatrosses associated with vessels that target tuna were 0.42 percent higher on average in $\delta^{15}N$ than female Laysan albatrosses associated with vessels that targeted tuna. Black-footed albatross diets did not differ between sexes, but tuna vessel associated black-footed albatrosses on average were 1.52 percent higher in $\delta^{15}N$ than Laysan albatrosses. Black-footed albatrosses associated with vessels that targeted swordfish were 1.41 percent higher on average in $\delta^{15}N$ than black-footed albatrosses associated with vessels that targeted tuna. Analyses of adult Laysan albatrosses salvaged from colonies at Kure, Midway and Kaua'i found differences in $\delta^{15}N$ between locations.

Kaua'i had the highest $\delta^{15}N$ values which were not different from tuna associated albatrosses. This could possibly be due to the close proximity of Kaua'i to O'ahu which is the center of the fishery. Stable isotope analyses of food items represented in diet reveal that the most important prey are also the highest in $\delta^{15}N$. Also, there was significant overlap in the stable isotope concentrations of bait used and the mesopelagic squid *Taonius borealis*. Hence, stable isotope differences cannot be explained by differences in fisheries associated scavenging.

There is considerable evidence for habitat segregation between Laysan and black-footed albatrosses, adding support to the argument that differences in stable isotope concentrations are likely due to feeding in different regions. However, there also appears to be some convergence in diet for albatrosses exposed to longline fishing during the breeding season. The overall effect on of the entire population of North Pacific albatrosses is unclear. We believe that continued work on salvaged albatross diet and isotope ratios, as well as combining radio tracking and stable isotope analysis will hopefully add clarity to these issues.

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2006 PFRP PROJECTS

Biology

- **Synchronous Assessment of Bigeye Tuna (*Thunnus obesus*) and Micronekton Biomass, Distribution, and Movement Patterns at Cross Seamount, and the Effects of the Seamount Environment**
  PIs: Reka Domokos, Kim Holland, and Jeffrey Polovina
- **Scaling Up: Linking FAD-associated Local Behavior of Tuna to Regional Scale Movements and Distribution**
  PIs: Kim Holland, Laurent Dagorn, and David Itano
- **Development of "Business Card" Tags: Inter-individual Data Transfer**
  PIs: Laurent Dagorn and Kim Holland
- **The Associative Dynamics of Tropical Tuna to a Large-scale Anchored FAD Array**
  PIs: David Itano, Kim Holland, and Laurent Dagorn

Trophodynamics

- **Assessment of the Impacts of Mesoscale Oceanographic Features on the Forage Base for Oceanic Predators**
  PIs: Jeff Drazen and Reka Domokos
- **Intra-guild Predation and Cannibalism in Pelagic Predators: Implications for the Dynamics, Assessment and Management of Pacific Tuna Populations**
  PIs: Tim Essington, Mark Maunder, and Robert Olson
- **Examining Latitudinal Variation in Food Webs leading to Top Predators in the Pacific Ocean**
  PIs: Jock Young, Robert Olson, Jeffrey Dambacher, and Valerie Allain
- **Climate and Fishing Impacts on the Spatial Population Dynamics of Tunas**
  PIs: Patrick Lehodey, Olivier Maury, Lisa Ballance, Arthur Miller, Raghu Murtugudde, and George Watters

Statistics & Modeling

- **Combining Individual and Population Based Estimation of Migration Pattern**
  PIs: Anders Nielsen and John Sibert
- **Investigation of Shark Bycatch in the Hawaii-based Longline Fishery, and an Extension of Analyses of Catch Data from Widely Separated Areas in the Pacific Ocean**
  PIs: William A. Walsh and Keith Bigelow
- **Performance of Longline Catchability Models in Assessments of Pacific Highly Migratory Species**
  PIs: Keith Bigelow, Mark Maunder, and Adam Langley
- **Rescue, Compilation, and Statistical Characterization of Historic Longline Data, Pacific Ocean Fisheries Investigation 1951-1973**
  PIs: Bert Kikkawa and Robert Skillman

Protected Species

- **Robust Statistical Re-evaluation of the Effect of Pelagic Longline Fisheries on Loggerhead Sea Turtle Stocks in the Pacific**
  PI: Milani Chaloupka

Socio-cultural

- **Distribution and Use of Seafood in the Context of Community: A Case Study of the Main Hawaiian Islands**
  PIs: Ed Glazier and Stewart Allen

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Trade-offs between Sea Turtle Interactions and Profitability of the Hawai'i-based Longline Fleet

Naresh C. Pradhan and PingSun Leung

The concerns for environmental impacts of fishing activities continue to pose a serious challenge to fishery managers in devising fishery management policies that are both economically and environmentally sound. Addressing these issues is particularly important with a view toward ecosystem-based fishery management. However, these objectives are inherently conflicting and delicate to balance.

There is a growing concern about the interactions of endangered sea turtles with the pelagic longline fishery in Hawai'i since the early 1990s. Accounting for endangered and protected sea turtle interactions with the pelagic longline fishery has become an important policy goal recently and some tough measures have been put into effect since 2000 to protect these turtles.

Stricter policies would obviously result in a more pronounced trade-off between tangible economic benefits and environmental amenities. Both are desirable if they can be attained simultaneously to the desired extremes. Shutting down the fishery on the other hand may lead to the transfer of the negative externality to other locations or jurisdictions with less regulations and enforceability. In such situations, it is important to determine how best to harness desired fishery resources while minimizing undesirable interactions with sea turtles.

Considering the above concerns, a multi-objective programming model for the Hawai'i longline fishery that incorporates sea turtle interactions[1] has been extended with spatial and seasonal dimensions. The rationale for this is that a certain location of the sea in a certain season of a year is more productive for harvesting some fish than other locations and seasons.

The same may also hold true on the foraging habit of sea turtles in the sense that they may be less frequent in certain areas of the sea and seasons of a year than other locations and seasons. The synergy of these factors could lead to a better optimal result, i.e., more of desired outputs in targeted fish species and less of sea turtle bycatches.

This study examines the extent to which better optimal balance can be achieved with these added features in the model. This study also traces the economically and environmentally efficient trade-off frontier curve by estimating the optimal level of fishing efforts, profit level, and resulting turtle takes, and estimates shadow costs of sea turtle interactions when the fishery operates sub-optimally.

The extended model used in this study considers fleet heterogeneity and fishers' micro-behaviors for a more realistic depiction of the longline fishery and determines the optimal pattern of fishing efforts in terms of the number of trips per year in an area and season by a vessel of a certain size category targeting for either tuna or swordfish. Two policy objectives are incorporated in the model: (1) to maximize the fleet-wide profit and (2) to minimize sea turtle interactions with the longline fishery.

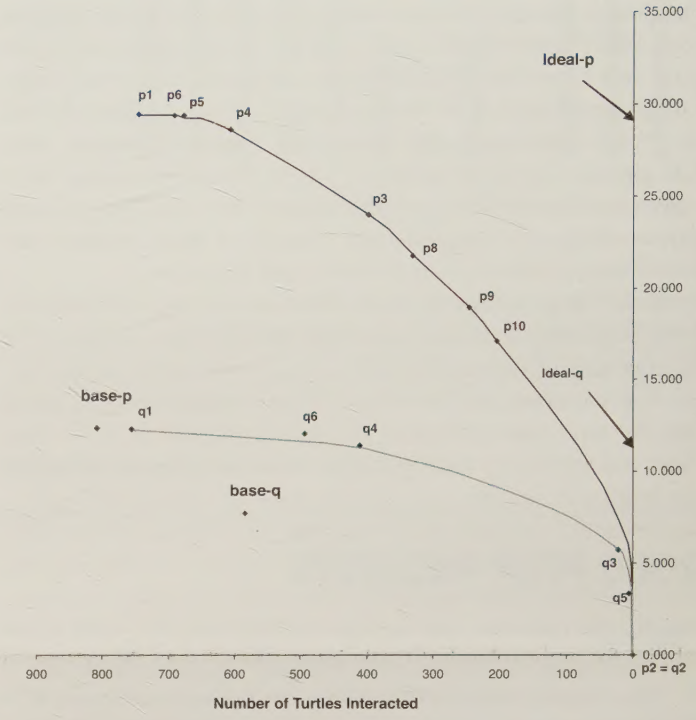

Figure 1. Comparative trade-off curve of fleet-wide profit and sea turtle interactions with and without spatial & seasonal dimensions in the model, Hawai'i Longline Fishery 1993.

The model imposed several constraints to ensure that the number of trips from the optimal solution would not overexploit the key species in the fishery. Further, a set of entry conditions is employed to make sure that there exist incentives to the vessel owners and fishing crews in a way that fishing trips are profitable.

This requires sales to exceed variable expenses in the short-run, recovery of owner's capital with net income exceeding fixed costs, and crew's net income to be higher than the opportunity cost of labor. The model assumes that fishing conditions are homogeneous across each of the four seasons (summer, fall, winter, spring) and within each of the five areas (Central, North/Northcentral, South, East/Northeast, and West/Northwest).

The optimization process involved solving for each of two objectives separately. The optimization of the first goal (i.e., maximization of fleet-wide profit) resulted in the fleet-wide revenue

[1] The mathematical details of the multi-objective programming model can be found in a forthcoming article in *Ecological Economics* titled "Incorporating sea turtle interactions in a multi-objective programming model for Hawai'i's longline fishery."

and profit of about $74 million and $30 million, respectively. They are about 34 percent and 136 percent higher than the actual revenue and profit in 1993 (the base year for this analysis), respectively. This would also require increasing the harvests of bigeye tuna by 54 percent and swordfish by 14 percent. These catches are well within the bound of historic maximum catches for these species. Moreover, the amount of sea turtle interaction was lower at this optimal effort level. However, the optimization of the second goal (i.e., minimization of the sea turtle interactions) suggests halting all fishing operations, but it is obviously not pragmatic.

These extreme solutions suggest an ideal point with the highest possible fleet-wide profit and minimal turtle interactions, but this ideal solution is clearly unachievable, and there is a trade-off between fleet-wide profit and the number of turtles interacted.

There also exist better economic and environmental efficiency gains in terms of higher profit and reduced turtle interactions compared to the base case (see Figure 1). Table 1 shows the optimal profits, efforts, fish catches, and the amount of turtle interactions for a given effort and profit level. Each point along the curve in Figure 1 represents fishing trips by vessel size, trip type, area, and season. The trade-off frontier curve is higher for the model with the spatial and seasonal dimensions (*p-series curve*) than the one derived from the model without these dimensions (*q-series curve*).

The distance between the two trade-off frontier curves represents the potential efficiency gain in terms of fleet-wide profitability for a given level of turtle interaction due to the synergy of spatial and seasonal dimensions in the enriched model. Further, restricting longline fishery to operate sub-optimally has an average per turtle shadow value of $15,957 and $60,908 in terms of lost fleet-wide profit and revenue, respectively.

(continued on page 6)

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UPCOMING EVENTS

Western and Central Pacific Fisheries Commission Scientific Committee (Second Regular Session)

August 7-18, 2006, Manila, Philippines
Contact: wcpfc@mail.fm
Online information: http://www.wcpfc.org

3rd International Symposium on Stock Enhancement and Sea Ranching

September 18-21, 2006, Seattle, Washington
Contact: Kiesha Marusa at info@searanching.org
Online information: http://www.searanching.org

Pelagic Ecosystems and Billfish Symposium

September 27-29, 2006, Cairns, Australia
Contact: billfish2006@ozaccom.com.au
Online information: http://www.cpgfa.asn.au/symposium/home.html

PICES (North Pacific Marine Science Organization) 15th Annual Meeting Boundary Current Ecosystems

October 13-22, 2006, Yokohama, Japan
Contact: secretariat@PICES.int
Online information: http://www.pices.int

American Geophysical Union (AGU) Fall Meeting

December 11-15, 2006, Moscone Center West, San Francisco
Contact: AGU Meetings Department at fm-help@agu.org (subject: 2006 Fall Meeting)
Online information: http://www.agu.org

Trade-offs Between Sea Turtle (continued from page 5)

Table 1. Fleet-wide profit, revenue, catches of major target species, number of turtles takes and kills, and shadow prices of turtles at various optimal points, Hawai'i longline fishery 1993.

Locus					Expected turtle takes and kills in 1993						Marginal shadow prices ($ per turtle)	
Optimal Points	Profit	Revenue	Bigeye	Swordfish	Turtle takes	Turtle kills	Loggerhead takes	Loggerhead kills	Leatherback takes	Leatherback kills	Lost profit	Lost revenue
p2 min	0	0	0	0	0	0	0	0	0	0		
p10	17.11	36.932	4.768	1.318	204	31	130	23	41	2	44,333	92,476
p9	18.972	40.816	4.842	2.347	246	38	157	28	50	2	29,144	76,845
p8	21.799	48.27	5.122	4.355	343	53	219	38	70	3	41,218	89,036
p3	24.066	53.167	5.294	5.572	398	61	254	45	81	4	22,413	70,832
p4	28.728	67.9	5.972	9.346	606	93	387	68	123	5	11,071	53,657
p5	29.503	71.656	6.092	10.35	676	103	431	76	137	6	2,857	59,429
p6	29.543	72.488	6.129	10.537	690	106	440	77	140	6	815	32,463
p1 max	29.587	74.241	6.185	10.92	744	114	475	83	151	7	0	0
Base	12.484	55.476	3.999	9.584	807	124	515	90	164	7		
Historical maximum (1991-98)			7.110	13.100								
Average (p1 to p3)											15,957	60,908

There is a clear testament for an existence of a win-win situation in the Hawai'i longline fishery. The trade-off frontier can be the basis of turtle-related fishery policy evaluation when compared with the base scenario. By comparing different sets of efficient solutions along the trade-off frontier curve, decision makers may choose appropriate measures to tackle the turtle-related issues in the fishery. However, the current fishery policy related to sea turtle interactions may limit capturing all the potential efficiency gains as illustrated from the model results, since the number of turtles allowed to get interacted severely limits swordfish-targeted longline fishing trips if fishers use the conventional technologies like J-hooks.

Where to limit the fishing effort along the frontier largely depends on the reasonable estimates of growth rate for the key critical turtle species and the degree of environmental protection the policy desires. Adaptation to "turtle-friendly" fishing technologies is among the many strategies that would allow for higher optimal fishing efforts leading to higher overall welfare and toward a more responsible fishery.

Indeed, there has been a significant reduction in the number of sea turtle interactions after the use of circled-hooks recently. In the end, it would also be advantageous to continue research on turtle mitigation measures, or to implement turtle-related fishery policies only in areas and seasons with high turtle interactions.

Rehabilitation and replenishment of endangered sea turtles and their habitats with cultured sea turtles is another strategy one might consider to keep the longline fishery viable. All the coastal communities have shared social responsibility for an ecosystem-based fishery, and a concerted international effort would be necessary to reduce sea turtle interactions.

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Scientists Discuss Fisheries Issues; Council Votes on Recommendations

The Scientific and Statistical Committee (SSC) of the Western Pacific Regional Fishery Management Council concluded a three-day meeting June 2 in Honolulu to discuss management of fisheries in offshore waters of the U.S. Pacific islands. Scientists from throughout the U.S. and the Pacific made the following recommendations, among others:

Bigeye and Yellowfin Overfishing Measures

The SSC recommended the immediate ending of overfishing of bigeye tuna across the Pacific and yellowfin tuna in the West-Central Pacific. While stocks of Pacific bigeye and West-Central Pacific tunas are still healthy, the level of fishing mortality on these stocks is too high to be sustainable in the longterm. The SSC recommended that purse seine and longline fishing effort on both species in the West-Central Pacific be reduced by 20 percent and by 30 percent for bigeye in the Eastern Pacific. Such actions would have to be taken by two Pacific regional fishery management organizations (RFMOs), responsible for international management of highly migratory species such as tunas.

These are the Western and Central Pacific Fishery Commission and the Inter-American Tropical Tuna Commission, which manages tuna stocks in the West-Central and Eastern Pacific respectively. Unilateral or independent action by the Western Pacific Council will be insufficient to end the unsustainable fishing mortality on these stocks, since fisheries under Council jurisdiction take only a small (<5 percent) of the Pacific yellowfin and bigeye catches. The SSC also recommended that the Council take an active role in securing the funding resources necessary to address data issues for managing these stocks, particularly the underreporting of yellowfin and bigeye tuna catches by some Southeast Asian nations.

Swordfish Fishery Measures for Hawai'i

The SSC also recommended that the Council amend its current Pelagic Fisheries Management Plan (FMP) to allow for an immediate closure of the Hawai'i shallow set swordfish longline fishing when caps on the bycatch of turtles is reached. Currently, the stringently regulated harvesting of swordfish by the Hawai'i fleet is regulated by a cap on fishing effort and a cap on the number of loggerhead (17) and leatherback (16) turtles that it may accidentally hook or entangle.

In 2005 the fishery operated within the turtle limits, but in 2006 the cap on loggerhead takes was reached. Under the current regulations, there is a seven-day window for the fleet to stop fishing, but concerns that additional turtles may be captured in this grace period led to an emergency rule by the National Marine Fisheries Service (NMFS) to close the fishery within 24 hours. Given the temporary nature of an emergency rule of this type, the SSC felt that the Council should modify its FMP so that such an action can be conducted routinely in the future.

Northwestern Hawaiian Islands Fishery Regulations

The SSC made several recommendations to the Council concerning the management of fisheries within the boundaries of the proposed Northwestern Hawaiian Islands (NWHI) National Marine Sanctuary. The proposed Sanctuary will comprise the entire 1,300 miles of the NWHI chain, from Kure Atoll in the west to Nihoa Island in the east, and will include constraints on fishing within the sanctuary boundaries. Although the primary motivation for implementing a sanctuary is for the coral reef habitat, some commercial pelagic fishing is conducted by handline and troll fishermen within the proposed sanctuary boundaries.

Given these constraints, the SSC voiced support for the Council's recommendation to allow three permits for commercial troll and handline fishing and for the initial three permits to be allocated based on historical participation in the NWHI pelagic fishery. Further, the SSC supported the concept of compensation for any fishermen displaced from fishing in the NWHI through the sanctuary process and recommended that a thorough economic study be conducted to properly evaluate compensation options. However, the SSC noted that the biological basis for the 180,000 pound cap on annual commercial pelagic catches within the sanctuary boundary, proposed by the National Oceanographic and Atmospheric Administration (NOAA), is unclear and encouraged continued effort to determine an appropriate biological and scientifically defensible annual catch limit.

Finally, the SSC recommended that while commercial extractive activities in the new NWHI sanctuary, such as fishing, would either be curtailed or constrained, some scientific collecting should be allowed for research purposes.

The Western Pacific Regional Fishery Management Council convened in American Samoa mid-June to address management of fisheries in federal waters of the U.S. Pacific islands, including those listed above. The Council voted to recommend the following measures regarding international pelagic fishery management, as well as the NWHI fisheries. The following is a partial list of its recommendations.

Overfishing of Bigeye and Yellowfin Tuna in the Pacific

- The Inter-American Tropical Tuna Commission (IATTC) to immediately reduce the bigeye catch in the purse seine fishery by 38 percent as recommended by the IATTC staff. If additional longline catch reductions are considered by IATTC, countries catching <1 percent on average of the bigeye catch should be allocated an annual quota of 500 mt for the 2007-2009 period. In addition, U.S. longline vessels not targeting bigeye tuna in the Eastern Pacific be exempted from the annual bigeye quota.
- The Western and Central Pacific Fishery Commission (WCPFC) to immediately reduce fishing mortality of yellowfin and bigeye by 20 percent in the WCPFC convention area utilizing capacity controls, fishing effort controls, limits on purse seine fishing

Scientists Discuss Fisheries (continued from page 7)

around fish aggregation devices (FADs) and national quotas. Countries that have increased their longline and purse seine fishing effort since 1999 should reduce their fishing effort in proportion to this increase. All measures must consider traditional participation and emerging island fisheries.

Hawai'i Longline Fishery for Swordfish

- Modify existing regulations to close the fishery immediately (without the current seven-day notice period) when it reaches its annual allowable interactions with sea turtles.

NWHI Fisheries

- Limit non-longline pelagic commercial fishing to three vessels, with transferable permits issued based on historical participation in the NWHI pelagic fishery.
- NOAA to compensate the NWHI fishermen displaced by the ongoing designation and implementation of the NWHI National Marine Sanctuary/Monument including options for purchasing their vessels, fishing gear and permits and providing compensation for lost income.
- Cap the annual commercial pelagic catch by the non-longline pelagic fishery and the limited-entry bottomfish fishery at 180,000 pounds per year.
- Prohibit all non-commercial fishing (except traditional and cultural Native Hawaiian sustenance fishing, i.e., harvest and consumption of fish within the NWHI Sanctuary/Monument) following closure of associated commercial fisheries.

For more detailed information regarding all Council recommendations, visit online at www.wpcouncil.org.

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